

AMENDMENT B
(37 C.F.R. 1.111)

IN THE SPECIFICATION:

Please amend the specification in accordance with 37 C.F.R. 1.121 as follows:

On page 1 at line 1, amend the title.

In the paragraph starting on page 3, line 23 and ending on page 4 at line 17.

In the three consecutive paragraphs starting at page 4, line 24 and ending at page 6, line 6.

On page 6, in the paragraph starting at line 17 and ending at line 19.

On page 8, the paragraph starting at line 4 and ending at line 6.

In the five consecutive paragraphs starting on page 8, line 11 and ending at line 19.

On page 8, in the paragraph starting at line 22 and ending at line 23.

On page 9, in the consecutive paragraphs starting at line 15 and ending at line 19.

In the consecutive paragraphs starting on page 11 at line 25 and ending on page 12 at line

18.

On page 16, in the paragraph starting at line 23 and ending at line 27.

On page 23, in the paragraph starting at line 6 and ending at line 25.

In the consecutive paragraphs starting on page 24 at line 17 and ending on page 26 at line

9.

In the consecutive paragraphs starting on page 27 at line 1 and ending on page 28 at line

23.

In the paragraph starting on page 29, line 14 and ending on page 30 at line 6.

13. In the consecutive paragraphs starting on page 30 at line 17 and ending on page 38 at line 25.
25. In the consecutive paragraphs starting on page 40 at line 5 and ending on page 45 at line 7.
7. In the paragraph starting on page 53 at line 17 and ending on page 54 at line 11.
23. In the consecutive paragraphs starting on page 55 at line 9 and ending on page 58 at line 23.
- In the paragraph starting on page 61 at line 10 and ending on page 62 at line 8.
- In the paragraph starting on page 63 at line 1 and ending on page 64 at line 2.
- In the paragraphs starting on page 64 at line 20 and ending on page 65 at line 26.
- In the paragraphs starting on page 66 at line 10 and ending on page 67 at line 2.
- In the consecutive paragraphs starting on page 67 at line 9 and ending on page 70 at line 3.
3. In the consecutive paragraphs starting on page 70 at line 13 and ending on page 71 at line 18.
18. In the paragraphs starting on page 72 at line 15 and ending on page 73 at line 14.
- In the consecutive paragraphs starting on page 75 at line 3 and ending on page 80 at line 10.
10. In the paragraph starting on page 81 at line 12 and ending on page 82 at line 3.
- In the paragraph starting on page 82 at line 16 and ending on page 82 at line 25.
- In the paragraphs starting on page 86 at line 25 and ending on page 87 at line 13.

In the paragraphs starting on page 87 at line 17 and ending on page 89 at line 3.

In the paragraphs starting on page 89 at line 11 and ending on page 90 at line 16.

In the paragraphs starting on page 91 at line 1 and ending on page 91 at line 27.

In the consecutive paragraphs starting on page 93 at line 4 and ending on page 98 at line

9.

The affected amended paragraphs are attached herein on separate sheets. The amendments were made primarily to change certain terms to more common generic terms as discussed with the Examiner in an August 18, 2004 telephone interview.

IN THE CLAIMS:

Please amend claims 1, 3, 5-7, 9-11, 13-18, 21, 27, 29, 33, 35-37, 39-45, 48, 52, 56, 58-60, 64, 66-68, 71, 77, 79, 83, 85-87, 89, 91, 95 and 98 in accordance with 37 C.F.R. 1.121.

The claims are attached herein on separate sheets.

IN THE ABSTRACT:

Please delete the Abstract as filed and substitute therefor the enclosed ABSTRACT OF THE DISCLOSURE, which is submitted herewith on a separate sheet of paper in accordance with 37 C.F.R. §1.72.

AMENDMENT TO SPECIFICATION

[Deleted material is struck-through and added material is underlined]

On page 1 at line 1, amend the title:

NEW CHEMICAL SPECIES OF MAGNECULAR CLUSTERS ~~MAGNECULES~~

On page 2, in the paragraph starting at line 7 and ending at line 21:

This invention relates, generally, to a novel chemical species, ~~called "magneccules",~~ which is composed of **magnecular** clusters of molecules, and/or dimers, and/or atoms formed by internal bonds due to the magnetic polarization of the orbits of at least some of the peripheral atomic electrons present in the cluster, the intrinsic magnetic field of nuclei present in the cluster, and the intrinsic magnetic fields of valence electrons present in the cluster that are not correlated in singlet couplings to other electrons to form valence bonds. This new chemical species is stable under normal temperature and pressure conditions. The novel chemical species of the present invention is formed in gases, liquids, and solids, and it is useful in a variety of applications, including, but not limited to, the energy industry, the fuel industry, the paint industry, the adhesive industry and the medical and pharmaceutical industries, to name a few.

In the paragraph starting on page 3, line 23 and ending on page 4 at line 17:

The exposure of a gas at atmospheric pressure to an electric arc may also create magnecular clusters ~~magnecules~~. They are generated, however, in such small numbers as to be undetectable. Accordingly, these magnecular clusters ~~magnecules~~ have no industrial or consumer value such as those that may be created by the arc disclosed in an unrelated invention described in U.S. Patent No. 5,487,874 to Gibboney, Jr. Therefore, the exposure of a molecular species of gas to an electric arc leaves the original molecular species mostly unchanged in the sense that the species remains an essentially pure population of conventional molecules with only traces of magnecular clusters ~~magnecules~~. Accordingly, only when a gas is forced to pass at very high pressure through a restricted area surrounding an electric arc of a PlasmaArcFlow Reactor of the present invention can the chemical species of magnecular clusters ~~magnecules~~ be produced in which a chemical species of molecules is turned into an essentially pure population of magnecular clusters ~~magnecules~~. Therefore, a well sustained pressure of about 100,000 psi is necessary, as well as other requirements discussed below, to achieve the formation of an essentially pure population of magnecular clusters ~~magnecules~~, such as that created in the PlasmaArcFlow Reactor. This sustained high pressure and other requirements, however, are not taught, disclosed or suggested by Gibboney.

In the three consecutive paragraphs starting at page 4, line 24 and ending at page 6, line 6:

In accordance with the present invention, a substantially pure population of new, stable clusters is provided. These clusters are formed in gas, liquid, or solid compositions and are composed of clusters of two or more of a molecule, a dimer, an atom and combinations thereof in combination with one or more of another molecule, dimer or atom, and any combination thereof. Further, these clusters are detectable by peaks in mass spectrometry, which are not identifiable as any known conventional molecule. In addition, these clusters have no infrared signature when formed in gases, no ultraviolet signature when formed in liquids, and no signature for solids other than those signatures of the conventional molecules and dimers constituting the magnecular clusters ~~magneccules~~, thus establishing that the bond cannot be of the valence type.

These new clusters are called magnecular clusters ~~magneccules~~ because of the magnetic nature of their internal attractive bond as described and documented in the following description. Magnecular clusters ~~magneccules~~ are formed by forcing a liquid or a gas through an electric arc between at least one pair of carbon-based electrodes. A combustible gas bubbles to the surface of the liquid for collection. The heat generated during the process is absorbed by the liquid and is usable as energy via heat exchangers. Solids precipitate to the bottom of the metal vessel for collection. Under a number of conditions related to kWh, flow and geometry of the electric arc, both the gases and liquids acquire an essentially pure magnecular structure.

Some of the important novel properties of magnecular clusters ~~magneccules~~ include: increased energy density; increased energy output under thermochemical reactions; increased adhesion with other substances; increased penetration within other substances; and other properties which are new when compared to the corresponding properties of the conventional

molecules constituting the magnecular clusters ~~magnecules~~ and any of their combinations.

Consequently, the new chemical species of magnecular clusters ~~magnecules~~ has new industrial and consumer applications such as fuels for internal combustion engines, fuels for fuel cells, paints, adhesives, as well as, medical and other uses.

On page 6, in the paragraph starting at line 17 and ending at line 19:

FIG. 1B is a depiction of a hydrogen atom identifying the force fields of the new chemical species of ~~magnecules~~ magnecular clusters of the present invention;

On page 8, the paragraph starting at line 4 and ending at line 6:

FIG. 7 is a depiction of the mass spectrometric (MS) peaks of a sample gas composed by the new chemical species of magnecular clusters ~~magnecules, called magnegas;~~

In the five consecutive paragraphs starting on page 8, line 11 and ending at line 19:

FIG. 10 is a depiction of the anomalous IR signature of the conventional CO₂ molecule contained in the gas composed of the present invention ~~magne~~gas;

FIG. 11 is a depiction of the lack of identification of other IR signature of the gas composed of the present invention ~~magne~~gas;

FIG. 12 is a depiction of the anomalous blank of the instrument following the analysis of the gas composed of the present invention ~~magne~~gas;

FIG. 13 is a depiction of another MS scan of the gas composed of the present invention ~~magne~~gas;

FIG. 14 is a depiction of the MS scan of the gas composed of the present invention ~~magne~~gas obtained 30 minutes after the results shown in FIG. 12;

On page 8, in the paragraph starting at line 22 and ending at line 23:

FIG. 16 is a depiction of a confirmation of the anomalous IR signature of the CO₂ molecule contained in the gas composed of the present invention ~~magne~~gas;

On page 9, in the consecutive paragraphs starting at line 15 and ending at line 19:

FIG. 21 shows spectroscopic experimental evidence of present invention ~~magnecules~~ in magnetically treated tap water;

FIG. 22 shows the spectroscopic experimental evidence of present invention ~~magnecules~~ in magnetically treated 50-50 mixture of tap water and fragrance oil "mixture 2."

In the consecutive paragraphs starting on page 11 at line 25 and ending on page 12 at line 18:

As is known in the art, the identity of a molecule can be unambiguously determined by combining two or more of the analytical methods discussed above. It is important to note that the sole use of GC-MS or LC-MS is not sufficient for a scientific determination of the identity of a molecule because a peak that is only identified by GC-MS, for example, could indeed belong to the new chemical species of the present invention and not necessarily belong to that of a molecule. This is due to the fact that the atomic constituents of the clusters of the present invention are bonded together by a force structurally different than that of a valence force, yet a ~~magneccule~~ magnecular cluster may have the same atomic weight as that of a conventional molecule. In other words, in order to reach a scientific identification of molecules as well as of magnecular clusters ~~magneccules~~, and to differentiate between them, two or more of the analytical methods discussed above must be used in combination, each one verifying the results of the other.

The present invention pertains to gaseous, liquid and solid state substances. The state of the substance depends on external conditions of temperature and pressure, the underlying molecules and magnecular clusters ~~magneccules~~ of a substance, however, remaining essentially the same in all three states.

On page 16, in the paragraph starting at line 23 and ending at line 27:

Since the new magnetic bond of this invention occurs at the level of individual atoms, the creation of the new chemical species ~~of magneccules~~ does not necessarily require a total net magnetic polarity. Thus, the new chemical species also exists for all substances, whether ferromagnetic or not.

On page 23, in the paragraph starting at line 6 and ending at line 25:

As is known in the art, atoms in their natural state do not possess a magnetic polarization of the orbit of peripheral electrons. Accordingly, such a polarization is not inherent in nature and must be intentionally fabricated. The present invention creates the above described magnetic polarizations in the structure of individual molecules, dimers and atoms irrespective of whether they are ionized or not and ferromagnetic or not. Further, the present invention utilizes such induced magnetic polarizations for the industrial production of a new chemical species given by an essentially pure population of clusters composed of individual molecules, and/or dimers, and/or atoms under a new bond of magnetic polarization origin. These novel clusters are stable at ordinary conditions of ambient temperature and atmospheric pressure. The present invention also describes the equipment and methods suitable for producing and analyzing these clusters, which are not molecules because their bond is not a valence bond. ~~Since the new bond creating these clusters is of a magnetic type, the new clusters are called magneccules, which terminology is very useful to distinguish magneccules from conventional molecules.~~

In the consecutive paragraphs starting on page 24 at line 17 and ending on page 26 at line 9:

The identification of the new chemical species of ~~magnecules~~ of the present invention, requires the following three steps: 1) ~~Magnecules~~ Magnecular clusters must be detected as clearly identified peaks in GC-MS scans for gases, LC-MS scans for liquids, and other conventional means for solids. The peaks of the magnecules produced by GC-MS scans for gases and LC-MS scans for liquids remain unidentified following a computer search and comparison with all known molecules; 2) The clusters ~~magnecules~~ individual peaks which are not identifiable by the MS scan also have no IR signature for gases and no UV signature for liquids, other than the signature of its molecular or dimer constituents; and 3) The identification of the clusters ~~magnecules~~ is completed and verified by additional experimental evidence, such as measurements of the average density of clusters ~~magnecules~~ which must be greater than that of any molecule contained in the cluster ~~magnecule~~, as well, as any of their combinations. Finally, the identification is completed by proof that the internal bond is not of valence but of magnetic polarization type as permitted by a number of unique characteristics solely possible under magnetic polarities as described below.

It must be stressed that, for gases or liquids under conventional conditions and not exposed to a magnetic or other field, MS scans are generally sufficient for the identification of molecules. Accordingly, the great majority of GC-MS and LC-MG have no IRD or UVD, respectively, and GC-MS equipped with IRD or LC-MS equipped with UVD are instruments generally available in military, governmental or other specialized laboratories. However, when

gases or liquids are exposed to strong magnetic fields or other interactions identified below, the sole use of MS detectors is grossly insufficient to identify molecules because the identifications by a MS scan must be completed with IR or UV detections. The latter identification is necessary because a peak with a given large atomic weight may appear as being that of a given molecule under the MS scan, while in reality it may have no IR or UV signature at all, thus establishing that said large peak cannot possibly be a molecule, since only the hydrogen and very few other light molecules have the perfect sphericity necessary for the absence of an IR signature, while it is physically impossible for large molecules to reach such a perfect spherical symmetry. As a result, scientific measurements which must be used to identify magnecular clusters ~~magneccules~~ are given by GC-MS equipped with IRD, or LC-MS equipped with UVD, where the word equipped is specifically referred to the requirement that both the MS and the IR or UV scans refer to exactly the same range of atomic weight in standard a.m.u. units. In fact, only under the latter condition can a given cluster be jointly analyzed under an MS and an IR or UV scans.

In the consecutive paragraphs starting on page 27 at line 1 and ending on page 28 at line 23:

d. The ~~word-magnecule-is~~ words magnecular clusters are used to represent clusters of two or more of a molecule, a dimer, an atom and combinations thereof in combination with one or more of another molecule, dimer or atom, and any combination thereof formed by an internal attractive bond among opposing, generally toroidal polarities of magnetic polarized orbits of at least one peripheral electron of the atoms constituting the magnecular clusters ~~said magnecules~~ in conjunction with a polarization of intrinsic magnetic moments of the nuclei of said atoms and a polarization of intrinsic magnetic moments of electrons when not correlated into valence bonds with antiparallel spins. ~~Magnecules~~ The clusters are stable under normal temperatures and pressures and are identifiable by GC-MS equipped with IRD for the gaseous state or LC-MG equipped with UVD for the liquid state or other means for solids via procedures established below. Said generally toroidal polarization needed for the production of the magnecular clusters ~~magnecules~~ can be caused by external magnetic, or electromagnetic fields or by other means, including but not limited to microwaves, friction, pressure, etc. Due to the magnetic bond, ~~magnecules,~~ magnecualr clusters have a variable atomic weight depending upon the number of molecules, and/or dimers, and/or atoms involved in the toroidal polarization. Magnecular clusters ~~Magnecules~~ are identifiable in mass spectrometry by novel peaks, which are unidentifiable by a computer search among all known conventional molecules. Also, magnecules have no infrared signature for gases, no ultraviolet signature for liquids and no other signature for solids except the infrared or ultraviolet signature of the individual molecules or dimers constituting said magnecular clusters ~~magnecules~~, for example, H₂, C-O, H-O, etc.

Magnecular clusters ~~Magnecules~~ have unique physical and chemical characteristics, including, but not limited to, a unique energy content, a unique density, a unique adhesion to and penetration within other substances, and a unique viscosity, to name a few. All magnecular clusters ~~magnecules~~, including their mass spectrometry peaks and unique physical and chemical characteristics, disappear at a sufficiently high temperature, such as at the temperature of combustion. A magnecular cluster ~~magnecule~~ is considered elementary when composed of only two molecules. A magneplex is entirely composed of several identical molecules.

~~Magneclusters are~~ Magnecular clusters can be composed of molecules of different types.

e. The words chemical species are used to denote an essentially pure population of stable clusters, thus implying the conventional chemical species of a molecule and the new chemical species ~~of magnecules~~.

The new chemical species of the present invention comprising of an essentially pure population of magnecular clusters ~~magnecules~~, can be industrially created in a form admitting of practical uses for any given substance in the gaseous or liquid state. ~~Magnecules~~ Clusters at the solid state are created by the solidification of liquid magnecular clusters ~~magnecules~~ due to a reduction in temperature. As an illustrative example, consider the simplest possible gaseous chemical species, that composed of a conventional hydrogen molecule $H_2 = H-H$.

In the paragraph starting on page 29, line 14 and ending on page 30 at line 6:

With reference to FIG. 4A, once two hydrogen molecules reach the polarization shown in FIG. 3C, they can bond together by the attractive force between opposing polarities of the magnetically polarized fields of their orbiting electrons, as well as of their nuclei, although in this case not for electrons since their coupled magnetic polarities are opposite to each other, by establishing in this way a bond chain, such as North-South/South-North/etc. The resulting cluster composed of two molecules is denoted by $(H-H)_x(H-H) = H_2xH_2$, where "x" denotes herein a magnetic bond. The latter structure is called an elementary hydrogen magnecular cluster magnecule. Such cluster magnecule is manifestly stable since any possible rotation due to temperature can only occur for the state H_2xH_2 as a whole, while any separation of said cluster magnecule into individual H_2 molecules requires a collision having an energy greater than the magnetic binding energy. This elementary hydrogen cluster magnecule is composed of magnetic bonds having opposite polarities, thus resulting in a lack of a total net magnetic polarity. In other words, magnecular clusters magnecules, which are constructed from given molecules, preserve the diamagnetic or ferromagnetic character of the molecular constituents.

In the consecutive paragraphs starting on page 30 at line 17 and ending on page 38 at line 13:

As illustrated in FIG. 4B, a magnecular cluster ~~magnecule~~ can also occur between a molecule H-H and a dimer C-H, irrespective of whether the latter is ionized or not and/or ferromagnetic or not. Finally, as depicted in FIG. 4C, a magnecular cluster ~~magnecule~~ can also occur between a hydrogen molecule H-H and an isolated hydrogen atom H. In fact, as computed and illustrated earlier, the strength of the magnetic bond of an isolated hydrogen atom to a hydrogen molecule is almost twice the strength of the magnetic bond between two hydrogen molecules. As indicated earlier, this follows from Pauli's exclusion principle, i.e., the condition that the two electrons of the hydrogen molecules must be coupled in singlet, namely, with antiparallel spins and magnetic moments, thus resulting in an essentially null total magnetic moment for the paired electrons with a consequential lack of appreciable contribution for magnetic bonds. The valence electron of an isolated hydrogen atom, on the contrary, is not coupled, and therefore, it is free to contribute to a magnetic bond via its intrinsic magnetic moment. Note that the magnecular cluster ~~magnecule~~ (H-H)xH shown in FIG. 4C can not be a molecule because, once the two electrons of the two hydrogen atoms bond-correlate themselves into a singlet quasi-particle state to form the molecule H-H as in FIG. 2A, they cannot bond with a third electron for various reasons, e.g., because a coupled electron pair is a Boson with spin zero while an individual electron is a Fermion with spin 1/2.

A gas magnecular cluster ~~magnecule~~ can be formed by a combination of the magnecular clusters ~~magnecules~~ of FIGS. 4A, 4B and 4C with several other molecules and/or dimers, and/or atoms resulting in large clusters which have been detected to have an atomic

weight all the way to 1,000 a.m.u. for gases, and tens of thousands a.m.u. for liquids. Further, depending on the geometry of the cluster, when a hydrogen atom in the core of a magnecular cluster ~~magnecule~~ is entirely surrounded by molecules, the hydrogen atom will remain an isolated atom. This also holds true for any other isolated atom or dimer.

As reviewed below, the presence of individual unbonded atoms within magnecular clusters ~~magnecules~~ has been experimentally verified and permits important industrial and consumer applications, such as, the production and use of gaseous compositions ~~called magnegas~~ composed of an essentially pure population of magnecular clusters ~~magnecules~~ produced as a by-product in the recycling of liquid waste via a submerged electric arc. ~~Magnegas~~ This gaseous composition has a unique energy content because, during combustion, it releases about three times the energy expected from the combustion of the conventional molecules constituting the gaseous composition ~~magnegas~~ and of any of their combinations. This unique energy release is due to the fact that combustion breaks the magnecular clusters ~~magnecules~~, thus releasing isolated atoms and dimers which, at that moment, recombine to form ordinary molecules with a consequential release of a large quantity of energy that is non-existent in fuels having conventional molecular structures.

As a specific example, the atomic composition of the gaseous composition ~~magnegas~~ produced via electric arcs submerged within distilled water with one electrode composed by a consumable pure graphite is made of 50% hydrogen atoms, 25% oxygen atoms and 25% carbon atoms, plus other atoms as impurities in parts per millions. In a conventional molecular composition, said H, O and C atoms would combine into conventional molecules. Since the affinity between carbon and oxygen is much greater than that between oxygen and hydrogen, the first molecular formation is that of CO, the second being that of H₂, with traces of O₂, H₂O and

CO₂. Therefore, the conventional chemical composition of a gas produced by an electric arc submerged within distilled water with one consumable graphite electrode is essentially given by 50% H₂ and 50% CO plus low levels of H₂O, CO₂ and O₂. Note that no light or heavy hydrocarbon can be admitted since the local temperature of a submerged electric arc is on the order of 10,000°C, at which temperature no hydrocarbon can possibly survive, assuming that it can be formed.

It is well known that the energy content of said 50-50 combination of conventional molecules H₂ and CO is 315 BTU/cf. By comparison, various measurements have established that the energy content of the gaseous composition magnegas with the same atomic constituents is about 950 BTU/cf, namely, about three times the predicted value. The excess energy content of magnegas produced from water and carbon electrodes has been proven beyond doubt by the inventor by converting a 1998 Honda Civic originally produced to run on compressed natural gas with its well known energy content of 1,050 BTU/cf. The compressed natural gas was removed from the vehicle and replaced with the compressed gaseous composition compressed magnegas, resulting in a performance, measured in a dynamometer, that was essentially equivalent to that of compressed natural gas. This Honda Civic, ~~which runs on compressed magnegas~~, was tested at U.S. MagnegasTM, Inc. in Largo, Florida. The excess energy release of 635 BTU/cf is due to the combination of the following three properties of the new chemical species of this invention:

- 1) Analytic tests on the new gaseous composition magnegas via infrared detectors or gas chromatograph have established that only approximately 70% of the H, C and O atoms in the above identified the new gaseous composition magnegas are bonded into H₂ and CO, while the remaining 30% of atoms are trapped uncoupled inside the magnecular clusters

~~magnecules~~ constituting the new gaseous composition ~~magnegas~~. At the time of the combustion, the magnecular clusters ~~magnecules~~ break down, by therefore releasing said isolated atoms, which are then in condition to combine into said H₂ and CO molecules. Both of these reactions are highly exoenergetic. In fact, the formation of H₂ releases about 110 Kcal/mole while the formation of CO releases about 255 Kcal/mole. It is therefore evident that the formation of conventional molecules H₂ and CO at the time of breakdown of the magnecular clusters ~~magnecules~~ caused by combustion provides a first contribution to the indicated excess energy release of 635 BTU/cf. In turn, such a contribution crucially depends on the existence of yet to be bonded isolated atoms in the magnecular clusters ~~magnecules~~, the existence of which is experimentally verified as shown below.

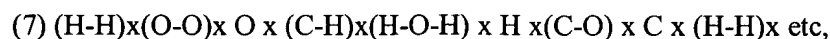
2) Once all magnecular clusters ~~magnecules~~ have been eliminated, and the new gas composition ~~magnegas~~ is reduced to its conventional molecular composition, combustion of the new gas composition ~~magnegas~~ with atmospheric oxygen occurs according to conventional chemical reactions. Following various measurements, such a combustion produces an exhaust composed of about 50% H₂O, 15% O₂, 5% CO₂, the rest being composed of nitrogen and other atmospheric gases. Recent studies conducted by R. M. Santilli and D. D. Shillady, "A new isochemical model of the water molecule," International Journal of Hydrogen Energy Volume 25, pages 173-183, 2000, have established that an essentially exact representation of all experimental data of the water molecule can be reached under the condition that the two pairs of valence electrons, one pair per each H-O dimer, are strongly correlated-bonded, resulting in a new model of the water molecule depicted in FIG. 5A. A visual inspection of the latter model establishes that exothermic chemical reactions, such as $H_2 + O \rightarrow H_2O + 57$ Kcal/mole, require for their occurrence a configuration of the orbits of atomic electrons suitable

for valence bonds. In other words, when the electron of the hydrogen atom has a distribution in all directions in space, it is not ready for bonding with a corresponding electron of the oxygen. Therefore, according to the new structure model of the water molecule of FIG. 5A, the degrees of freedom of both valence electrons of the H and O molecules must be restricted to permit said valence bond into H₂O. After the creation of such a valence bond, rotational motions re-establish the conventional spherical distribution shown in FIG. 5B, although this time for coupled-correlated, rather than isolated valence electrons. The magnetic polarization at the foundation of this invention provides a configuration of peripheral atomic electrons in a form ready for their valence bonds with other electrons, as shown in the comparison of FIGS. 1C and 5A. It then follows that chemical reactions of the type $H_2 + O \rightarrow H_2O$ release more energy when occurring among magnetically polarized atoms as compared to the same reaction among atoms in conventional unpolarized conditions, e.g., because in a given mole of gas the former reactions are more statistically probable than the latter. In conclusion, a second contribution to the excess energy content of the new gas composition ~~magnegas~~ originates from an excess energy released by conventional chemical reactions caused by the polarized nature of the orbits of valence electrons of the individual atomic constituents, thus having in this way a configuration of the valence electrons ready for said chemical reactions, while such a configuration has to be created prior and in order to permit said chemical reactions for conventional magnetically unpolarized gases.

3) A third new contribution to the excess energy content of the new gas composition ~~magnegas~~ is due to the creation of new bonds of magnetic type in the interior of conventional molecules. Consider, as an example, the conventional unpolarized molecule CO with the usual double valence bonds for which it can be written C=O. The infrared signature of

C=O shows two peaks which, as is well known, represent the two valence bonds of the considered molecule. It is also well known that each internal bond represents an internal storage of energy which can participate in ordinary exothermal reactions, such as $\text{CO} + \text{O} \rightarrow \text{CO}_2$. Experimental evidence, as discussed in further detail below, has established that a magnetic polarization of the molecule C=O can create a new internal bond which is established by the existence of a new peak in its infrared signature. This peak cannot evidently be an additional valence bond, since the four available valence electrons are all used in the double bond C=O. On the contrary, as shown in FIG. 6A, said new bond can indeed be of magnetic type and, more particularly, be due to a new attractive force among two opposite polarities North-South of the two magnetic polarizations South-North and South-North of non-valence electrons of the individual C and O atoms in the C=O structure. Along similar lines, and as illustrated in FIG. 6B, it is easy to see that, when exposed to sufficiently strong external magnetic fields, the conventional molecule $\text{CO}_2 = \text{O}-\text{C}-\text{O}$ can acquire two additional internal magnetic bonds. But, as indicated above, each peak in the infrared signature represents a bond with corresponding energy storage. It then follows that magnetically polarized molecules with additional peaks in their infrared signatures release more energy in thermochemical reactions than that released by unpolarized molecules, thus providing the above indicated third contribution to the excess energy content of the new gas composition ~~magnegas~~.

By use the assumed symbols of "-" to represent valence bonds and "x" to represent magnetic bonds, a generic example of a gas magnecular cluster ~~magneccule~~ is given by equation (7)



in which the bonds are formed by chains of coupled opposing polarities North-South-North-South-North-etc. The above new chemical composition is the only possible explanation of how MS analyses of a light gas such, as the the new gas composition ~~magnegas~~ produced via a submerged electric arc, has stable detectable clusters all the way to 1,000 a.m.u., while the biggest possible cluster contained in such a light gas should be CO₂ with 44 a.m.u.

This latter feature has also been experimentally verified by measurements of the specific density of gases and liquids with a magnecular structure, which is greater than that of any combination of conventional molecular constituents. In turn, the increased density not only confirms the presence of clusters ~~magnecules~~, but also has important industrial and consumer applications. For instance, combustible fuels with a magnecular structure, not only have an energy release which is a multiple of the corresponding energy release for an ordinary molecular structure, but also the duration of use of a given volume at a given pressure of the fuel with a magnecular structure is a multiple of that of the same volume with the same fuel which only possess a conventional molecular structure.

In the case of liquids, molecules do not generally rotate on their center of gravity due to the intermolecular bonds existing within liquids. Accordingly, magnecular clusters ~~magnecules~~ are more readily created in liquids than in gases. Moreover, the average atomic weight of the magnecular clusters ~~magnecules~~ is larger than the average atomic weight of the individual molecular constituents and that of any of their possible combinations. This increased atomic weight, when combined with the increased energy output for thermochemical reactions, has important industrial and consumer applications.

In the consecutive paragraphs starting on page 40 at line 5 and ending on page 45 at line 25:

As verified by U.S. MagnegasTM, Inc., a Florida corporation, by the conversion of one Ferrari and two Honda automobiles, the new chemical species ~~of magneccules~~ of this invention resolves all the above major problems.

To begin, the conversion of a conventional hydrogen gas into one with a magnecular structure permits the achievement of an increased energy density sufficient for an acceptable duration of automotive use with one tank of compressed gas, thus avoiding the expensive and dangerous liquefaction currently required for hydrogen. As an illustration, a Honda Civic available at the indicated U.S. MagnegasTM, Inc., has a range of about 2.5 hours when operating with one thousand cubic feet of the new gas ~~magnegas~~ compressed at about 3,600 psi, with range of the order of four hours for the use of a tank of the same size as the preceding one, but operating at 4,500 psi. These automotive ranges are amply sufficient for local commuting usage.

Second, as verified by a Ferrari 1980 model GTSi converted at U.S. MagnegasTM, Inc., to operate on the new gas ~~magnegas~~, the increased energy output ~~of magneccules~~ under thermochemical reactions permits the achievement of a performance with the compressed gas ~~magnegas~~ which is equivalent to that achieved with gasoline. This second important property has been verified by numerous tests performed at the Moroso International Track in West Palm Beach, Florida, via the indicated Ferrari 308 GTSi 1980 converted to operate on the compressed gas ~~magnegas~~ and compared to similar cars operating on gasoline.

Third, conventional hydrogen gas cannot contain any appreciable percentage of oxygen to avoid possible self-combustion with consequential explosions. As a result, the automotive

combustion of hydrogen can only be done via the depletion of breathable oxygen from our atmosphere. On the contrary, as also verified by U.S. MagnegasTM, Inc., an essentially pure population of magnecular clusters ~~magneccules~~ primarily composed by hydrogen can indeed contain an appreciable percentage of oxygen without any risk of self-combustion or explosions due to the stability of the magnecular clusters ~~magneccules~~, thus reducing the depletion of breathable oxygen from our atmosphere. As an illustration, the above described converted automobiles operating on the compressed gas ~~magnegas~~, contain in the exhaust up to 14% of breathable oxygen, thus being the only known combustion exhaust capable of sustaining life. It should be noted that the oxygen content in the gas ~~magnegas~~ does not originate from our atmosphere, but rather from the liquid waste used in its production, thus replenishing in this way the oxygen content of our atmosphere.

The most efficient device for creating an essentially pure population of magnecular clusters ~~magneccules~~ suitable for industrial or consumer applications is the PlasmaArcFlow Reactor, as described in FIGS. 26 and 27. The PlasmaArcFlow Reactor forces a liquid waste to pass through an underliquid DC electric arc with at least one consumable carbon-based electrode, having, for instance, 1000 amps and 30 volts. With reference to FIGS. 26 and 27, the arc decomposes the liquid molecules and the carbon electrode by creating a plasma of mostly ionized atoms of hydrogen, oxygen, carbon and other elements. The flow of the liquid continuously moves the plasma away from the arc; the plasma cools down in the liquid surrounding the arc; ionized atoms re-acquire their electrons; a number of chemical and other reactions take place; magnegas bubbles to the surface of the liquid where it is collected while solids precipitate at the bottom of the liquid where they are periodically collected. In this way a liquid waste is recycled into the clean burning gas of magnecular structure ~~magnegas~~, heat acquired by the liquid,

which heat is usable via a heat exchanger, and solids precipitating at the bottom of the reactor where they are collected.

As is known, magnetic fields are inversely proportional to the square of the distance at which they are detected. When the atomic constituents of molecules are exposed to magnetic fields created by the electric arc, that is, at distances of 10^{-8} cm, said magnetic fields are proportional to 10^{16} Gauss, thus having an intensity large enough to produce all possible magnetic polarizations. Atoms that are born under such maximal magnetic polarization then couple themselves via magnetic bonds, as well as valence bonds, resulting in an essentially pure chemical species of magnecular clusters ~~magneccules~~ generally composed of molecules, dimers and individual atoms. In summary, as illustrated by the experimental evidence provided below, the use of an electric arc within a liquid waste, such as automotive antifreeze and oil waste, yields an essentially pure population of magnecular clusters ~~magneccules~~ at the gaseous state without any appreciable content of molecules.

Magnecular clusters ~~Magneccules~~ can also be formed by a variety of other means. For instance, magnecular clusters ~~magneccules~~ can be produced by electromagnetic fields, which can cause a polarization essentially as in the case of an electric arc. Magnecular clusters ~~Magneccules~~ can also be formed by microwaves capable of removing the rotational degrees of freedom of molecules or atoms, resulting in magnetic polarizations, which couple to each other. Similarly, magnecular clusters ~~magneccules~~ can be formed by subjecting a material to a pressure that is sufficiently high to remove the orbital rotations. Magnecular clusters ~~Magneccules~~ can also be formed by friction or by any other means not necessarily possessing magnetic or electric fields, yet capable of removing the rotational degrees of freedom within individual atomic structures, resulting in consequential magnetic polarizations.

The destruction of magnecular clusters ~~magneccules~~ is achieved by subjecting the essentially pure population of magnecular clusters ~~magneccules~~ to a temperature greater than the magnecular clusters' ~~magneccules'~~ Curie Temperature, which varies from magnecular cluster ~~magneccule~~ to magnecular cluster ~~magneccule~~.

Magnecular clusters ~~Magneccules~~ have several characteristics that uniquely identify them as a new chemical species, among which we note:

- 1) inability to identify the peaks of magnecular clusters ~~magneccules~~ in GC-MS analyses via computer searches among all known molecules;
- 2) lack of infrared signature for gases, lack of ultraviolet signature for liquids, and lack of other signatures for solids, except those of the conventional molecules or dimers constituting the magnecular clusters ~~magneccules~~;
- 3) average density greater than the average density of all molecular constituents or any of their combinations;
- 4) presence in the magnecular clusters ~~magneccules~~ of individual unbounded dimers and/or atoms;
- 5) appearance in the infrared signature of the molecules constituting the magnecular clusters ~~magneccules~~ of new peaks denoting a new internal bond with a consequential new means of storing energy;
- 6) energy released in thermochemical reactions due to the formation of conventional molecules at the time of the break-down of the magnecular clusters ~~magneccules~~ which is generally a multiple of the energy released by conventional molecular constituents;

- 7) energy produced by conventional exothermic reactions for magnetically polarized molecular constituents of magnecular clusters ~~magnecules~~ which is also a multiple of the energy released by chemical reactions for unpolarized molecular constituents;
- 8) alteration in time, called mutation, of the MS peaks representing the magnecular clusters ~~magnecules~~ due to collisions, break down of some of the magnecular clusters ~~magnecules~~, and consequential formation of other magnecular clusters ~~magnecules~~, or just accretion of smaller magnecular clusters ~~magnecules~~ or molecules or dimers, or atoms;
- 9) alteration, called mutation, of generally all conventional physical characteristics, such as viscosity, transparency to light, index of refraction, etc.;
- 10) adhesion to walls of containment chambers which is much greater than that of the same unpolarized substance due to the well-known property that magnetism can be propagated by induction;
- 11) absorption or penetration through other substances which is much greater than those of the same unpolarized gas; and
- 12) termination of all of these unique characteristics at a sufficiently high temperature called Curie Temperature.

Since magnecular clusters ~~magnecules~~ have properties very different from those of conventional molecules the experimental detection of magnecular clusters ~~magnecules~~ requires special care. In particular, methods which have been conceived and constructed for the detection of molecules are not necessarily effective for the detection of the different chemical species of magnecular clusters ~~magnecules~~ precisely in view of the indicated unique characteristics. For instance, GC-MS equipment, which is very effective for the detection of conventional molecules is basically insufficient for the detection of magnecules because of the crucial requirement

indicated earlier that every peak in the MS should be jointly inspected in the IR, thus requiring the necessary use of GC-MS equipped with IRD. A molecule can be claimed to occur in magnetically polarized substances only following a dual identification, first, via a peak in the MS and second, a verification that such a peak admits the IR signature precisely of the claimed molecule. A magnecular cluster ~~magneccule~~ occurs when both identifications are missing, namely, the MS peak cannot be identified by computer search and comparison among all existing molecules, and the peak has no IR signature other than those of the much lighter molecules and/or dimers constituting the magnecular cluster ~~magneccule~~.

In the consecutive paragraphs starting on page 46 at line 15 and ending on page 51 at line 7:

It should be stressed that the lack of verification of any one of the above conditions generally implies the impossibility to detect magnecular clusters ~~magneccules~~. For instance, the use of a feeding line with 0.5 mm ID is excessive for a conventional light gas, while it is necessary for a gas with magnecular structure such as the new gas composition discussed above ~~magneccules~~. This is due to the unique adhesion of the magnecular clusters ~~magneccules~~ against the walls of the feeding line, resulting in an occluded feeding line which prevents the passage of the most important magnecular clusters ~~magneccules~~ to be detected, those with large magnecular weight.

Similarly, it is customary for tests of conventional gases to use GC-MS with columns at high temperature to obtain readings in the shortest possible time, since conventional molecules are perfectly stable under the temperatures here considered. The use of such method would also prevent the detection of the very quantities to be detected, the magnecular clusters ~~magneccules~~, because, as indicated earlier, they have a characteristic Curie Temperature varying from case to case at which value all unique magnetic characteristics are terminated. Magnecular clusters ~~Magneccules~~ are stable at ordinary temperatures and, consequently, they should be measured at ordinary temperatures.

Along similar lines, recall that a GC-MS with a short ramp time is generally used for rapidity of results. Again, the use of such a practice, which has been proven by extensive evidence to be effective for molecules, will prevent clear detection of magnecular clusters ~~magneccules~~. In fact, if the ramp time is much less than 25 minutes, e.g., it is of the order of one minute, all the peaks of magnecular clusters ~~magneccules~~ generally combine into one single

large peak, as verified below. In this case the analyst is generally lead to inspect an individual section of said large peak. However, in so doing, the analyst identifies conventional molecules constituting the magnecular cluster ~~magnecule~~, and not the magnecular cluster ~~magnecule~~ itself. When these detectors with short ramp times are equipped with IRD, the latter identify the infrared signatures of individual conventional molecules constituting said large peak, and do not identify the possible IR signature of the single large peak itself. Therefore, a GC-MS with short ramp time is basically unsuited for the detection of magnecular clusters ~~magnecules~~ because it cannot separate all existing peaks into individual peaks, but groups them all together into one single large peak which is unidentifiable as a whole, resulting in the generally erroneous opinion that the chemical composition considered is that of conventional molecules without sufficient scientific evidence.

The test of a gas with magnecular structure via a GC-MS and, separately, via an IRD is also grossly misleading and improper. This is due to the well known, general tendency to identify a peak in the MS with a conventional molecule which, at times, may be also present in the separate IRD test, leading to a potentially erroneous conclusion of conventional chemical composition because, as it is well known, IRD do not detect complete molecules, but only their dimers. However, unlike the case for the conventional molecules, dimers can be constituents of magnecular clusters ~~magnecules~~. Therefore, the sole identification of a dimer in the IRD not connected to the GC-MS is, by no means, evidence that the corresponding molecule exists in the gas considered.

A typical illustration is given by the detection in a GC-MS without IRD of a peak at 44 a.m.u., which is generally assumed to be CO₂. The separate IR test of the same gas may indeed yield the characteristic signature of carbon dioxide, thus leading to the opinion that the peak here

considered is the CO₂. In reality, the IRD has only detected in this case the C-O dimer, while the MS peak at 44 a.m.u. may be due to the magnecular cluster ~~magnecule~~ (C-O)_x(H-H)_x(H-H)-C which has indeed atomic weight 44 a.m.u., while admitting indeed the IR signature of CO₂. This ambiguity is due to the fact that, in the case here considered, the IR test is done separately from the MS test. On the contrary, the same ambiguity does not exist for GC-MS equipped with IRD because, in the latter case, the equipment can be restricted to the sole detection of peaks in the vicinity of 44 a.m.u. at both the MS and the IR modes. The lack of MS identification of the peak at 44 a.m.u. in this case establishes beyond doubt that the peak with 44 a.m.u. here considered cannot possibly be a molecule.

Similarly, peaks with 18 a.m.u. are generally associated with the water molecule H-O-H. Such an interpretation may be correct for the case of conventional, magnetically unpolarized gases. However, for the case of the new gas of magnecular structure, ~~magnegas~~ the interpretation is generally erroneous because the peak at 18 a.m.u. may have no infrared signature when tested with a GC-MS equipped with IRD, and the indicated atomic weight can be reached via the magnecular cluster ~~magnecule~~ (H-H)_x(H-H)_xC_x(H-H).

In conclusion, the experimental evidence of the above occurrences, as outlined below, establishes the need in the detection of gas magnecular clusters ~~magnecules~~ of avoiding, rather than using, techniques and equipment with a proved efficiency for molecules, thus avoiding the use of GC-MS without IRD, with short ramp time, high column temperatures, feeding line with a small section, and other established techniques. On the contrary, new techniques specifically conceived for the detection of magnecular clusters ~~magnecules~~ should be worked out.

The conditions for scientific measurements of magnecular clusters ~~magnecules~~ in liquids are essentially the same as those for gas magnecular clusters ~~magnecules~~, except for the

use of LC-MS/UVD, rather than GC-MS/IRD. Liquid magnecular clusters ~~magneccules~~ possess similar properties and characteristics and require similar detection conditions as those needed for gases, with particular reference to increased size of feeding lines and columns.

The magnecular clusters ~~magneccules~~ of the present invention are producible by the equipment disclosed in U.S. Patent No. 6,183,604 B1, which is incorporated herein by reference in its entirety. With reference to FIG. 27, the embodiment of the above patent is based on a hollow, cylindrical shaped, carbon based anode rotating edgewise against a stationary tungsten based cathode. Additional means of producing the magnecular clusters ~~magneccules~~ of the present invention are disclosed herein. With reference to FIGS. 26A, 26B and 26C, a preferred embodiment of the additional means is essentially that of FIG. 27 in which the electrodes are constituted by two carbon based cylindrical rods. More particularly, the flow of the liquid through the arc can indeed occur for the configuration of the electrodes of FIG. 27 or the solid rod shaped electrodes as in the configuration of FIG. 26A. On the contrary, the flow of the arc as in FIGS. 26B and 26C requires a containment of the arc itself described below, which containment is more adequately permitted by the rod shaped electrodes of FIGS. 26B and 26C, as compared to the hollow cylindrical configuration of the cathode of FIG. 27.

In conclusion, the flow of the liquid through the arc, which permits the production of an essentially pure population of magnecular clusters ~~magneccule~~, as described below can be realized with a variety of electrodes. The first and simplest embodiment is that of FIG. 26A in which the flow occurs through an unrestricted arc. In this case the arc can be that of the configuration between the electrodes of FIG. 27, or of FIG. 26A, or of other shapes of the electrodes. Other embodiments demand the enclosure of the arc itself within an area specified below. In this case the electrodes of FIG. 27 should be modified into the rod shape forms of

FIGS. 26B and 26C, while the rest of the equipment remains unchanged. The latter simple replacement is tacitly implied below whenever needed.

In the paragraph starting on page 53 at line 17 and ending on page 54 at line 11:

FIG 26C depicts a third preferred embodiment of the PlasmaArcFlow equipment for the production of an essentially pure population of magnecular clusters ~~magnecules~~ at both the gaseous and liquid states. This third embodiment consists of a venturi 26 in the shape of a cylinder with 1.250 inches internal diameter, 2 inches exterior diameter and 12 inches in length constructed from an insulating material such as phenolic or ceramic and ending with two flanges on each end for attachment to the rest of the embodiment described below, plus one port for the entrance of a liquid and a second port for the exit of the same. Two carbonaceous electrodes, 20, 22 each of 1 inch in diameter and 24 inches in length, are placed in the interior of venturi 26 in such a manner that: 1) the rods 20, 22 and the venturi 26 have the same cylindrical symmetry axis; 2) there is a 0.125 inches thick empty cylindrical interspace between the carbonaceous rods 20, 22 and the interior of the venturi 26; 3) the rods 20, 22 are sealed at each of the two ends of the venturi 26 so as to avoid escape of the liquid being pumped through; 4) an electrical connection of each of the two electrodes 20, 22 to each polarity of a DC generator with 75 kWh (not shown); and 5) the position of the electric arc is within anywhere of 12 inches in length of the venturi 26.

In the consecutive paragraphs starting on page 55 at line 9 and ending on page 58 at line 23:

The flow of the liquid through the venturi 26 continuously removes the plasma following its formation, resulting in a combustible gas, ~~called magnegas~~, which is composed of an essentially pure population of gas magnecular clusters ~~magnecules~~. The recirculation of the liquid through the arc for the duration of 1 hour for a 75 kWh DC electric arc and 25 gallons of the recirculating liquid create an essentially pure population of liquid magnecular clusters ~~magnecules~~. Much shorter periods of recirculation of the liquid are needed for proportionately larger DC power units. For instance, an essentially pure population of 25 gallons of liquid magnecules can be formed in 10 minutes via the venturi 26 of FIG. 26C and 150 kWh DC power unit.

The main difference between the embodiment of FIG. 26C and the preceding two embodiments of Figs. 26A and 26B is that, as shown in FIGS. 26A and 26B the flow of the liquid is perpendicular to the symmetry axis of the carbonaceous rods, while in the embodiment of FIG. 26C the flow of the liquid is parallel to the cylindrical symmetry axis of, as well as surrounding the exterior of the carbonaceous rods, to provide the production of an essentially pure population of gas and liquid magnecular clusters ~~magnecules~~ from an electric arc.

The achievement of an essentially pure population of magnecular clusters ~~magnecules~~ by the embodiments of FIGS. 26 and 27 is proven and verified by the spectroscopic data provided herein. Specifically, the peaks detected by the MS scans remain unidentified following a search among all molecules, and the peaks have no infrared or ultraviolet signature, respectively, this confirming the lack of valence bonds as discussed herein.

By comparison, the embodiments of the prior art, such as that according to U.S. Patent No. 5,487,874 (the '874 patent) dealing with an electric arc within the chamber of an internal combustion engine may produce gas magnecular clusters ~~magnecules~~. Any gas magnecular clusters ~~magnecules~~ so produced are present in minute amounts in comparison to conventional molecules present so as not to be detectable by available GC-MS analyzers. More particularly, the magnecular clusters ~~magnecules~~, which may be created by such an embodiment, are so small in number that they do not emerge from the background noise of the analyzing instrument. This is due to the dramatic numerical differences between the embodiments of the '874 patent and the present invention. First, the arc of the '874 patent occurs within a gas while it occurs within a liquid in the embodiment of this invention. The transition from liquid to gas provides the transition from unit volume of the liquid to 1,800 units of volume of the gas at atmospheric pressure. The compression in the combustion chamber of an engine results in a ratio of the densities of matter in the embodiment of the '874 patent and the present invention on the order of 1,500. This difference explains the creation of mere traces of magnecular clusters ~~magnecules~~ in the embodiment of the '874 patent and definitely is not an essentially pure population of magnecular clusters ~~magnecules~~.

Moreover, sparks of internal combustion engines are notoriously limited in the amount of electric energy they can use for various reasons related to arcing, safety, etc. In fact, the DC spark in the engine of ordinary cars has about 15,000 V and 100 milliamps, resulting in about 150 W. By comparison, the embodiment of this invention can use up to 75,000 W in the case of 1 inch carbonaceous rods, with virtually unlimited larger values of the electric power for proportionately larger carbonaceous rods. Since the creation of magnecular clusters ~~magnecules~~ is directly dependent on the electric energy, this second dramatic difference in

numerical values between the prior art and the present invention further establishes that the prior art can only create traces of magnecular clusters ~~magnecules~~, while the present invention produces an essentially pure population of magnecular clusters ~~magnecules~~.

The third and most important numerical difference between the prior art and this invention is due to the fact that the electric arcs of pre-existing embodiments are stationary, and, for the case of the '874 patent pulsating and stationary, while the embodiment of this invention provides the flowing of the plasma through a continuous arc. More specifically, in the '874 patent traces of magnecular clusters ~~magnecules~~ can only be created in the immediate vicinity of the spark itself, because immediately thereafter there is combustion. By contrast, the DC electric arc of the present invention does not cause any combustion, and, therefore, operates continuously. Moreover, the PlasmaArcFlow continuously removes the plasma full of magnecular clusters ~~magnecules~~ immediately following its creation, thus permitting a continuous creation of magnecular clusters ~~magnecules~~. Further, the spark in an internal combustion engine has the duration on the order of one nanosecond and the frequency of about 5,000 sparks per minute, while the arc of the present invention is continuous, such a difference provides an efficiency in the production of magnecular clusters ~~magnecules~~ in the present invention which is at least 1,000,000 times that of the '874 patent.

A similar situation exists for liquid magnecular clusters ~~magnecules~~. However, as is made clear from the above discussion, the prior art can at best create traces of magnecular clusters ~~magnecules~~ in such small numbers as not to be detectable with available LC-MS/UVD equipment. The present invention provides for the first time an essentially pure population of liquid magnecular clusters ~~magnecules~~ via the embodiments of FIGS. 26 and 27, namely, via the continuous forcing of a liquid through a continuously running electric arc.

All embodiments of the present invention also work for AC electric arcs, although the efficiency in the production of the combustible ~~gas~~ magnegas is in this case reduced due to the reversal of the arc itself with a frequency equal to that of the AC current.

In the paragraph starting on page 61 at line 10 and ending on page 62 at line 8:

The operation of the preferred embodiment of the high pressure PlasmaArcFlow reactor of FIG. 27 is as follows: the cylindrical carbon or coal anode 70 is inserted into its copper holder 99 and placed in the position suitable to initiate the arc; the closed reactor vessel is filled up completely with the liquid waste 38 to be recycled, such as automotive antifreeze waste or engine oil waste or crude oil; the reactor is then primed with magnegas for the complete removal of atmospheric oxygen in the interior of the vessel; the PlasmaArcFlow and heat utilization pumps are activated; the automatic feeder 45 of the electric arc is initiated at a distance from the equipment or via computer sequence; the cylindrical carbon or coal anode 70 initiates rotation edgewise with respect to the tungsten cathode 62, while advancing also head-on until the electric arc is initiated; as the carbon or coal is consumed by the electric arc at one point of the edge of the cylinder anode 70, the rotation of the latter, plus its micrometric downward motion when needed, permit keeping constant the electric voltage of the arc, thus maintaining constant its gap; the gas magnegas is immediately produced following the initiation of the electric arc, jointly with the production of heat in the liquid; operation initiates at atmospheric internal pressure, and rapidly increases with the production of magnegas to the preset pressure of the gauge-valve assembly 77; all gas magnegas produced in excess of said pre-determined pressure is then permitted to exit the reactor and be pumped into conventional storage tanks.

In the paragraph starting on page 63 at line 1 and ending on page 64 at line 2:

The high pressure PlasmaArcFlow reactor of FIG. 27 has an efficiency that is dramatically greater than that of low pressure reactors, because the production of the gas ~~magne gas~~ in the electrodes gap displaces the liquid waste to be recycled, as a consequence of which the electric arc occurs for the majority of the time, estimated to be 60%, within the gas ~~magne gas~~ produced, rather than within the liquid.

By comparison, when operated at pressures on the order of 200 or 300 psi, the bubbles of gas ~~magne gas~~ produced by the electric arc are dramatically reduced in size by at least 99%. Accordingly, the electric arc occurs for the majority of the time within the liquid to be recycled, thus dramatically increasing the production of gas ~~magne gas~~, with a corresponding dramatic increase in the heat produced.

Detailed calculations based on hadronic mechanics, hadronic superconductivity, and hadronic chemistry, estimate that the over-unity of the high pressure PlasmaArcFlow reactor of FIG. 27, when operating at 300 psi, is at least 30, of which an over-unity of 10 is expected for the production of gas ~~magne gas~~, and an over-unity of 20 is expected in the production of usable heat.

As is known, electric generators have an efficiency of 30%, the efficiency of the high pressure hadronic reactor of FIG. 27 is self-sustaining, in the sense that the gas ~~magne gas~~ produced is sufficient to power an electric generator for the production of the DC electric current needed to operate the hadronic reactor itself, and then remaining with sufficient gas ~~magne gas~~ to be used for other purposes, in addition to the production of a large amount of usable heat.

In the paragraphs starting on page 64 at line 20 and ending on page 65 at line 26:

Individual substances can be removed from ~~magnegas~~ the produced gas via chemical or other means while preserving the remaining magnecular structure. An illustration is given of the removal of carbon monoxide from the gas ~~magnegas~~, resulting in a carbon-free version of gas ~~magnegas~~, which is essentially given by hydrogen with an essentially pure magnecular structure, called magnecular hydrogen. ~~"maghydrogen."~~ The magnecular structure is preserved as proven by measurements of average weight, which is up to 20 a.m.u., which is up to ten times the weight of a conventional hydrogen gas. Accordingly, ~~maghydrogen~~ magnecular hydrogen is preferable over conventional hydrogen in all its fuel applications, with particular reference, but not limited to the use of ~~maghydrogen~~ magnecular hydrogen as a fuel for internal combustion engines and fuel cells. In fact, measurements conducted at U.S. MagnegasTM, Inc., of Largo, Florida, prove that a given volume of ~~maghydrogen~~ magnecular hydrogen at a given pressure lasts at least ten times longer than the same volume of conventional hydrogen at the same pressure, while having an increase in energy output in cars or an increase in efficiency in fuel cells of at least 10% due to the reasons indicated above, including the additional energy storage in magnecules or a better geometric readiness of the polarized gas for valence bonds in combustion as compared to conventional hydrogen gas.

The PlasmaArcFlow reactors depicted in FIGS. 26 and 27 can also be used by replacing the liquid in the vessel with a gas, provided that the equipment is suitably modified to withstand interior gas pressures of at least 10,000 psi. This is readily possible because, for the treatment of gases, there is no need for carbon-based electrodes, which can therefore be nonconsumable such as those made of tungsten. Accordingly, there is no longer any need for the electrodes to

penetrate into the vessel, or for the vessel to have an opening for the removal of the gas ~~magne~~gas produced when operating with liquids. As a result, the vessel of FIG. 27 can be completely sealed, thus readily suitable to withstand 10,000 psi of internal pressure or more.

In the paragraphs starting on page 66 at line 10 and ending on page 67 at line 2:

The advantages of the creation of a magnecular structure in a given gas are evident; are based on the desired specific features of magnecular clusters ~~magneccules~~; and their selection depends on the specific application. For instance, a magnecular structure is advantageous when the specific application at hand requires an increased atomic weight, or an increased adhesion, or an increased solution within liquids.

One application of particular industrial, consumer and environmental interest is the creation in the PlasmaArcFlow equipment identified above of oxygen with an essentially pure magnecular structure, called ~~"magoxygen."~~ magnecular oxygen. Again, this particular form of oxygen is created by using a PlasmaArcFlow reactor modified to withstand at least 10,000 psi, and then continuously recirculating the oxygen through one of the venturies of FIGS. 26A, 26B or 26C operated by a continuous arc between nonconsumable tungsten electrodes with DC 75 kWh electric power, yielding an arc with 1,500 A and 33 V. In this case 100 cubic feet of oxygen can acquire an essentially pure population of magnecular clusters ~~magneccules~~ in about 30 minutes of operation, with evident shorter operating times for bigger electric powers.

In the consecutive paragraphs starting on page 67 at line 9 and ending on page 70 at line 3:

~~Mag~~~~oxygen~~ Magnecular oxygen is important in combustion. As indicated above, the combustion of magnecular hydrogen ~~maghydrogen~~ provides an increase of energy output or efficiency of at least 10% as compared to the energy output or efficiency, respectively, of the combustion of conventional hydrogen, resulting in a total increase of 20% of energy output, which is significant and important for the fuel cells industry.

In conclusion, subject to the modifications identified above, PlasmaArcFlow reactors produce an essentially pure population of magnecular clusters ~~magneccules~~ by filling up the vessel either with liquids or with gases. Accordingly, the substance contained in the PlasmaArcFlow reactor shall hereinafter referred to as a "fluid" in its traditional meaning of denoting either a liquid or a gas.

The following experimental evidence establishes the scientific and industrial validity of the present invention and is not meant in any way implicitly or intentionally to restrict the scope of the invention. These experimental results unequivocally establish the existence of magnecular clusters ~~magneccules~~ in gases, liquids and solids, as well as establish each of their unique features. All experimental verifications have been conducted several times. In the following we outline, for brevity, only two out of the several verifications available per each individual feature of magnecular clusters ~~magneccules~~. Further, all tests were conducted at independent laboratories identified below per each test, which laboratory had no affiliation of any type to the inventor and/or any of his associates.

The first experimental detection of magnecular clusters ~~magnecules~~ via GC-MS/IRD occurred at the McClellan Air Force Base in North Highland, California via measurements conducted on a sample of the new magnecular structured gas ~~magnegas~~. The measurements were conducted on an HP GC model 5890, an HP MS model 5972, and an HP IRD model 5965 attached to the GC-MS. In particular, the equipment was set for the analytic method VOC IRMS.M utilizing an HP Ultra 2 column 25 m long with a 0.32 mm ID and a film thickness of 0.52 μm . The analysis was conducted from 40 a.m.u. to 500 a.m.u. The GC-MS/IRD was set at the lowest possible temperature of 10°C; the largest possible feeding line having an ID of 0.5 mm was installed; the feeding line itself was cryogenically cooled; the equipment was set at the longest possible ramp time of 26 minutes; and a linear flow velocity of 50 cm/sec was selected. Background measurements of the instrument were taken prior to any injection of the gas ~~magnegas~~. The instrument was also inspected and approved, confirming the lack of any contaminants.

After waiting for 26 minutes, sixteen large peaks appeared on the MS screen between 40 and 500 a.m.u. as shown in FIG. 7. Each of these sixteen MS peaks resulted to be "unknown", following a computer search of database on all known molecules available at McClellan Air Force Base, as shown in FIG 8. No identifiable CO₂ peak was detected at all in the MS spectrum between 40 and 500 a.m.u., contrary to the known presence of such a conventional molecule in the gas ~~magnegas~~.

Upon the completion of the MS measurements, exactly the same range of 40 to 500 a.m.u. was subjected to IR detection. None of the sixteen peaks had any infrared signature at all, as shown in FIG. 9. Further, the IR scan for these MS peaks shows only a peak belonging to CO₂ with very small traces of other substances. Note that the IR signature of the other components,

such as CO or O₂ are not detectable in this test because their atomic weights are below the left margin of the scan. In addition, the IR peak of CO₂ is itself different from that of the unpolarized molecule CO₂ as shown in FIG. 10. Note that the computer interprets the IR signature as that belonging to CO which is evidently erroneous because CO is outside of the selected range of a.m.u. units. All remaining small peaks of the IR scan also resulted to be "unknown" following a computer search in the database of IR signatures of all known molecules available at the McClellan Air Force Base, as illustrated in FIG. 11. Following the removal of ~~gas magnegas~~ from the GC-MS/IRD and conventional flushing, anomalous peaks were detected in the background similar to those of FIG. 7. Following a weekend long bakeout, the background, as shown in Fig. 12, was still anomalous, since the known correct version has a slope opposite to that of FIG. 12. The correct background was regained only after flushing the instrument with an inert gas at very high temperature.

In the consecutive paragraphs starting on page 70 at line 13 and ending on page 71 at line 18:

~~Magnegas~~ The magnecular structured gas was subjected to two MS tests reproduced in FIGS. 13 and 14, which occurred at about 30 minutes difference in time. As one can see, the peaks in FIG. 14 are macroscopically different from the peaks of FIG. 13 detected on the same sample just 30 minutes earlier. This difference confirmed the prediction that, when colliding, ~~magneccules~~ magnecular clusters break down into fragments, which then recombine with other molecules, atoms, and/or other ~~magneccules~~ magnecular clusters to form new ~~magneccules~~ magnecular clusters. Similarly, the mutation of ~~magneccules~~ magnecular clusters can occur via the accretion of another polarized atom, dimer, molecule, or ~~magneccule~~ magnecular cluster, without breaking.

In fact, as shown by comparing the scans of FIGS. 13 and 14: the peak at 286 a.m.u. of the former becoming 287 a.m.u. in the latter, thus establishing the accretion of one hydrogen atom; the peak at 302 a.m.u. in the former becomes one at 319 a.m.u. in the latter, thus establishing the accretion of the H-O dimer; the peak at 328 a.m.u. in the former becomes 334 a.m.u. in the latter, thus establishing the accretion of one O₂ molecule; the peak at 299 a.m.u. in the former becomes 297 a.m.u. in the latter, thus exhibiting the loss of one H₂ molecule; etc. These features have been confirmed by all subsequent GC-MS/IRD scans on the gas magnegas.

FIG. 15 depicts the complete failure by the GC-MS/IRD to identify the peaks of FIGS. 13 and 14 following a search in the database among all known molecules. FIG. 16 confirms in full the mutated IR signature of CO₂ previously identified at the McClellan Air Force Base, shown in FIG. 10, including the presence of two new peaks, with the sole difference that, this time, the

computer correctly identifies the signature as that of carbon dioxide. FIG. 17 presents the background of the instrument after routine flushing with an inert gas which background, as one can see, essentially preserves the peaks of the tests, thus confirming the unique adhesion of the ~~magneccules~~ magnecular clusters to the instrument walls.

In the paragraphs starting on page 72 at line 15 and ending on page 73 at line 14:

The large differences of MS peaks in the above two tests of exactly the same gas in exactly the same range from 40 to 500 a.m.u. although done with two different GC-MS/IRD illustrates the importance of having a ramp time of the order of 26 minutes. In fact, sixteen different peaks appeared in the MS scan following a ramp time of 26 minutes, as illustrated by FIG. 7, while all these peaks collapsed into one single peak in the MS scan of FIGS. 13 and 14, because the latter were done with a ramp time of about one minute. Therefore, the collapse of the sixteen peaks of FIG. 7 into the single large peak of FIGS. 13 and 14 is not a feature of magnecular clusters ~~magnecules~~, but rather it is due to the insufficient ramp time of the latter instrument.

The clear interpretation of the experimental evidence of FIGS. 7 to 17 is discussed below. In particular, the sixteen peaks in the MS of FIG. 7, all in macroscopic percentages, all unidentified by the computer search, none of which possesses an IR signature, establish beyond any possible doubt that the chemical composition of the gas ~~magnegas~~ in the range 40 to 500 a.m.u. is totally, rather than substantially, composed by a new chemical species, namely by a pure population of clusters with new internal bonds of non-valence type. In fact, the lack of IR signature establishes that said sixteen peaks cannot possibly be molecules due to the absolute impossibility of reaching perfect spherical symmetry for such large clusters, since the perfect spherical symmetry is achievable only for very light molecules such as the hydrogen as in FIG. 2A.

In the consecutive paragraphs starting on page 75 at line 3 and ending on page 80 at line 10:

Alternatively, the experimental evidence of FIG. 17 establishes that the clusters composing the gas magnegas have such a large magnetic polarization that they are capable of inducing the same in the atoms of the instrument walls. The magnetic field produced by a DC electric arc with 1500 amps and 33 volts when considered at atomic or molecular distances of 10^{-8} cm result in a magnetic field on the order of 10^{16} Gauss. The magnetic origin of the bonding force is then consequential, as confirmed by numerous other evidence, such as the origination of magnegas under the extremely high magnetic field in the molecular vicinity of an electric arc, and consequential polarization of the magnetic moment of the orbits of at least the valence electrons; the polarization of the intrinsic magnetic moment of nuclei; and the polarization of the intrinsic magnetic moment of electrons when not bonded in pairs into valence couplings with antiparallel spins, as indicated earlier. Once created, these three magnetic fields are amply sufficient in intensity and stability to create a chain of magnetically polarized molecules, and/or dimers, and/or atoms, which attract each other at short distances via opposite magnetic polarities, resulting in chains such as North x South x North x South x North x South x Unlike the case of bonds caused by electric polarizations, once bonded, magnetic polarizations are stable up to the Curie Temperature since rotations and other motions due to temperature occur for magnetically coupled polarities as a whole.

FIGS. 13 and 14 also establish the existence in magnecular clusters ~~magnecules~~ of individual atoms. In fact, the peak at 286 a.m.u. in FIG. 13 becomes 287 a.m.u. in FIG. 14, which can only be explained by the accretion of one isolated hydrogen atom, as indicated earlier. Similar evidence, not shown, exists for the accretion of one single atom of carbon or oxygen.

Note that the very existence in magnecular gas ~~magnegas~~ of fully identifiable peaks with atomic weight of the order of several hundreds a.m.u. is direct evidence of a new chemical species. In fact, the gas ~~magnegas~~ is produced from a plasma at about 10,000°C of mostly ionized atoms of hydrogen, carbon and oxygen. When produced from distilled water via a submerged electric arc between consumable pure carbon electrodes, as it is the case for the gas ~~magnegas~~ of the tests here considered, said plasma is composed of 50% hydrogen atoms, 25% carbon atoms and 25% oxygen atoms. Consequently, in the absence of any magnetic polarization, and assuming maximal flow of the arc, the plasma should produce a gas consisting of 50% hydrogen and 50% CO with traces of O₂, H₂O and CO₂. In fact, all possible hydrocarbons must be excluded because they could not possibly survive at the 10,000°C of the submerged electric arc, assuming that they could be formed at said temperature. In conclusion, in the absence of magnetic polarizations, the heaviest possible peak, which should exist in the ~~magnegas~~ of the tests here considered, should be the CO₂ molecule with 44 a.m.u. Therefore, the experimental evidence here presented of MS peaks in macroscopic percentages with several hundreds of a.m.u., as established by the measurements of FIGS. 7, 13 and 14, provide incontrovertible evidence of the new chemical species capable of constructing said heavy peaks via the use of lighter constituents.

The same presence of large peaks all the way to 500 a.m.u. establishes the increase in atomic density caused by magnetic polarization. In fact, the form of gas ~~magnegas~~ composed of 50% H₂ and 50% CO should have the average density of 15 a.m.u. while densities up to 200 a.m.u. have been measured in the laboratory for this gas.

Several additional embodiments have been constructed and experiments have been conducted to create and detect magnecular clusters ~~magnecules~~ in liquids. As indicated earlier,

the creation of magnecular clusters ~~magnecules~~ in liquids is easier than that in gases due to the dramatic reduction of rotational, vibrational and other motions in liquids as compared to those in gases. As a result, the polarization of the orbits of peripheral atomic electrons in liquids requires magnetic fields much weaker than those needed for gases. In fact, in the gas magnecular clusters ~~magnecules~~ of the preceding scans were obtained with magnetic fields which, at molecular distances, are of the order of 10^{16} Gauss (G), while the liquid magnecules in the tests reviewed below were obtained with a magnetic field of the order of 12,000 G which is sufficient to reach measurable results. However, such a magnetic field will not produce a substantially pure population as illustrated in FIG. 18A, 18B, 19A and 19B unless it is maintained for an extended period of time on the order of about thirty (30) days. Accordingly it is clear that an essentially pure population of magnecular clusters ~~magnecules~~ in liquids requires either very strong magnetic fields applied for a short period of time, or comparatively weak magnetic fields applied for a long period of time.

Even though the creation of detectable magnecular clusters ~~magnecules~~ in liquid is easier than that in gases, the detection of liquid magnecules is considerably more difficult than that of gas magnecular clusters ~~magnecules~~ because the virtual totality of analytic equipment available in existing laboratories is given by LC-MS without any UVD, and with small feed lines. Moreover, the available LC-MS operate at very high column temperatures, such as of the order of 250°C, which temperatures are generally greater than the Curie Temperature of the liquid magnecular clusters ~~magnecules~~ themselves. As a result, the very injection of the liquid in the instrument generally destroys all entities to be detected, resulting in a generally erroneous perception of a completely conventional molecular composition without real scientific evidence.

In fact, for magnetically polarized liquids, conventional molecular interpretations are in dramatic disagreement with a number of other experimental data, thus having no scientific credibility. As a specific illustration, the creation of the new chemical species of magnecular clusters ~~magnecules~~ in oils implies: 1) a dramatic transition from complete transparency to its complete absence; 2) a dramatic increase in specific density; 3) a dramatic change in adhesion, chemical reactions, surface tension, and other features. It is evident that any attempt to represent such dramatic changes via the conventional species of molecules has no scientific credibility, while all the same changes are readily represented in a quantitative form by the new species of magnecular clusters ~~magnecules~~.

Ironically, currently used feeding lines, syringes and methods do not even permit the injection of liquid magnecules in the LC-MS, let alone their detection. This is because, unlike the case of gases, liquid magnecular clusters ~~magnecules~~ can be so large as to be visible to the naked eye, thus being much larger than the sectional area of feeding lines currently used for conventional liquids. Even when feeding lines have the same dimension as those of liquid magnecular clusters ~~magnecules~~, the latter cannot freely propagate in them due to their anomalous adhesion which, in certain cases required the use of strong acids for their removal. Under these unfavorable conditions, one can at best expect that only small fragments of magnecular clusters ~~magnecules~~ can enter conventional LC-MS, and positively no claim of measurements can be ventured for magnecular clusters ~~magnecules~~ visible to the naked eye with dimensions greater than the feeding lines, syringes and other injection instruments.

The above occurrences confirm the general inability of currently available LC-MS to detect liquid magnecular clusters ~~magnecules~~, and the need stressed earlier of new equipment and procedures specifically conceived to detect the new chemical species of magnecular

~~clusters~~ ~~magnecules~~. In fact, liquid magnecular clusters ~~magnecules~~ are fully identified via the use of the appropriate LC-MS instrument equipped with the UVD, and verifying the other requirements indicated earlier, such as column temperature below the Curie Temperature of the magnecule to be detected, use of very large feeding lines, ramp times of the order of 25 minutes or more, etc.

The experimental evidence establishing the existence of liquid magnecular clusters ~~magnecules~~ and their unique properties is summarized below. A number of samples of fragrance oils were obtained from a distributor of such oils. The samples were all perfectly transparent and each had a known viscosity. Fifty cc of each of these oils were placed in individual glass containers. Several alnico permanent magnets with 12,000 G and dimension 1/2" by 1" by 2" were used. A polarity of said permanent magnets was then immersed in the jars filled with said fragrance oils, while the other polarity was outside the liquid.

In the paragraph starting on page 81 at line 12 and ending on page 82 at line 3:

Consider, for instance, two liquids, which are not soluble in each other, such as water and oil, which both have the H-O dimers. Under the exposure of a conventional mixture of said two liquids to a magnetic field, individual dimers H-O may acquire a magnetic polarization, resulting in the planar configuration of FIG. 5A. It then follows that one molecule of water can indeed bond to one molecule of oil via the magnetic bond of their respective H-O dimers, while the remaining parts of the two molecules remain in their conventional state. By keeping in mind that oil molecules may have a large number of H-O dimers, then another dimer of the preceding oil molecule can bond magnetically to an H-O dimer of another water molecule, or the second H-O dimer of the first water molecule can bond to an H-O dimer of another oil molecule, resulting in this way in a chain of partially bonded liquid molecules. The net result is the creation of a completely new liquid between two liquids, which are not soluble in each other, which new liquid is not a solution or a suspension or any other prior art configuration, but it is constituted of the new chemical species of liquid magnecular clusters ~~magneccules~~.

In the paragraph starting on page 82 at line 16 and ending on page 82 at line 25.:

Note that the magnecular clusters ~~magnecules~~ are not constituted by the individual "bricks," but rather by the opaque substance which interlocks said "bricks," since the latter preserves the original transparency. Inspection of the photographs shows a variety of sizes of magnecular clusters ~~magnecules~~, thus establishing their lack of unique atomic weight for any given oil. If valence bonds were involved a fixed maximal size would be shown. The photographs also show the accretion capability of magnecular clusters ~~magnecules~~, that is, their capability of increasing their size via the addition of other magnetically polarized molecules.

In the paragraphs starting on page 86 at line 25 and ending on page 87 at line 13:

The above indicated measurements also established other unique chemical properties of liquid magnecular clusters ~~magnecules~~. The most visible one was the malfunctioning of all equipment following their exposure to magnetically polarized liquids and their standard cleaning used for all conventional liquids. Following contact with liquid magnecular clusters ~~magnecules~~, the instruments were cleaned with very strong acids at high temperature, after which conventional working conditions were regained. The malfunction was evidently caused by the unique adhesion of magnecular clusters ~~magnecules~~, which, for the case of liquids is so dramatic as to require high temperatures for their removal.

The above tests also confirmed the unique thermochemical behavior of liquid magnecular clusters ~~magnecules~~. In fact, the action of acids on magnetically treated liquids was dramatically different both in energy release as well as color and appearance as compared to the action of the same acid on a magnetically unpolarized liquid.

In the paragraphs starting on page 87 at line 17 and ending on page 89 at line 3:

Other examples of an essentially pure population of magnecular clusters ~~magnecules~~ in liquid have been obtained at U.S. MagnegasTM, Inc., Largo, Florida, with the PlasmaArcFlow Reactor as described above with a DC electric arc of 1000 amps and 30 volts. Three different examples of essentially pure populations of magnecular clusters ~~magnecules~~ were obtained. The first species was obtained by flowing antifreeze through the electric arc for approximately two (2) hours. The second species was obtained by flowing engine oil through the electric arc for approximately two (2) hours. The third species was obtained by mixing equal volumes of the above two species, which do not normally mix, yet these substances mixed after the treatment indicated above and bonded in such a fashion to be so dense as to be non-pumpable.

As indicated earlier, magnecular clusters ~~magnecules~~ are also present in solids. In particular, all liquids with a magnecular structure preserve the new species when frozen and then liquefied again. In fact, all unique characteristics were recovered in the return to the liquid state, thus confirming the preservation of magnecular clusters ~~magnecules~~ in the transition from liquid to solid state, as readily expected, since such a transition implies a decrease of Brownian and other motions with a consequential increase in stability of the magnecular clusters ~~magnecules~~. Therefore, the experimental evidence on the existence of magnecular clusters ~~magnecules~~ in gases and liquids is direct experimental evidence of the existence of magnecular clusters ~~magnecules~~ in solids, since the latter can be merely obtained by freezing the former.

The first mass spectrographic experimental evidence on magnecular clusters ~~magnecules~~ in liquids was established at the Tekmar-Dohrmann Corporation (TDC) in

Cincinnati, Ohio, by operating a Tekmar 7000 HT Static Headspace Autosampler equipped with a Flame Ionization Detector (FID). The measurements were done on: Sample 1, pure magnetically untreated "Fragrance Oil"; Sample 2, magnetically treated tap water; and Sample 3, a magnetically treated mixture of the preceding two liquids.

Recall that magnecules in liquids can have very large atomic weights all the way to 10,000 a.m.u. and more, thus requiring instruments equipped with very large feeding lines, and capable of scanning all the way to very high weights. These and other features were absent in the indicated Tekmar instrument. Despite that, the TDC tests constitute direct mass spectroscopic experimental evidence of the existence of magnecular clusters ~~magnecules~~ in liquids, including direct experimental evidence of water magnecular clusters ~~magnecules~~.

In the paragraphs starting on page 89 at line 11 and ending on page 90 at line 16:

FIG. 21 shows spectroscopic experimental evidence of magnecular clusters ~~magnecules~~ in magnetically treated tap water and characterized by the large unknown peak at 25.763 min whose default report, not shown, and 64.24%. According to the terminology introduced earlier, this unknown peak represents a magneplex, namely, a magnecule solely composed of magnetically polarized molecules of the same type, in this case that of water. In fact, the field of the 12,000 G used for the magnetic polarization of water cannot possibly break down the water molecule. Therefore, the magnecular cluster ~~magnecule~~ here referred to is solely composed of molecule without any appreciable percentage of dimers and/or of isolated atoms. Finally, the magnetic polarization was done on water, thus implying that the constituents of the magnecular cluster ~~magnecule~~ here considered are the same, thus resulting in a magneplex.

FIG. 22 reproduces experimental evidence of magnecular clusters ~~magnecules~~ in a magnetically treated 50-50 mixture of tap water and fragrance oil "Mixture 2". The primary stable clusters detected by the instruments according to the default report, not shown, are: a first peak at 6.449 min for 5.33%; a second peak at 7.373 min for 18.74%; a third peak listed by the equipment as unknown 1 at 26.272 min for 1.75%; a fourth peak at 26.347 for 1.16%; a fifth peak listed by the equipment as unknown 2 at 31.491 for 0.45%; and a sixth peak at 32.758 min for 68.71%. Comparison of the above scan with the separate scans of tap water and the fragrance oil "Mixture 2" establishes beyond any possible doubt the creation of liquid magnecular clusters ~~magnecules~~ by the magnetic polarization of their mixture. Since the intensity of the magnetic field here used was absolutely insufficient to break down the molecules of water and of the fragrance oil, the only possible constituents of the new peaks are conventional molecules.

Therefore, the new clusters characterized by the unknown peaks of this scan are given by water molecules plus oil molecules 1, 2 and 3 of FIG. 20.

In the paragraphs starting on page 91 at line 1 and ending on page 91 at line 27:

Numerous additional tests were conducted at the TDC laboratory, not reported here for brevity. These tests confirmed all other features of liquid magnecular clusters ~~magnecules~~, such as their mutation, i.e., the variation in time of their atomic weight or percentage, and their unique adhesion. In fact, all blanks of the Tekmar instrument following measurements of liquid magnecules were dramatically different than the blanks prior to the injection of magnetically polarized liquids. Moreover, the peaks of the blanks were essentially those of the magnecular clusters ~~magnecules~~, rather than of conventional molecules. As indicated earlier, this occurrence is due to the induction of a magnetic polarization by magnecular clusters ~~magnecules~~ on the instrument walls, resulting in a consequential unique adhesion. As a matter of fact, one way to confirm the detection of a magnecular cluster ~~magnecule~~ during a test is by verifying that such a magnecular cluster ~~magnecule~~ does indeed persist in the blank following the completion of the test, a procedure which is important for this invention but completely senseless for the conventional chemical species of molecules. In any case, as it was the case for gas magnecular clusters ~~magnecules~~, conventional blanks are readily obtained by flushing the instrument with a suitable inert substance at high temperature.

Comprehensive tests via a very modern LC-MS equipped with UVD were conducted on magnetically treated liquids at the Department of Chemistry of Florida International University in Miami (FIU). These tests were conducted under a number of technical characterizations specifically selected to detect magnecular clusters ~~magnecules~~, such as:

In the consecutive paragraphs starting on page 93 at line 4 and ending on page 98 at line 9:

Inspection of the scans of FIGS. 23 - 25, as well as, of the numerous others obtained at FIU establishes beyond any possible doubt the existence of magnecular clusters ~~magneccules~~ in liquids characterized by various unknown MS peaks, none of which has any UV signature other than that of the molecular constituents, one of which is represented by the large unknown peak in FIGS. 24 and 25. Note a corresponding decrease of the peaks representing conventional molecules as compared to the value of FIG. 23. The latter occurrence is necessary for the correct detection of magnecular clusters ~~magneccules~~ because molecules are removed in their conventionally detected state when turned as constituents of magnecular clusters ~~magneccules~~. The same FIU tests confirmed all other features of liquid magnecular clusters ~~magneccules~~, such as their mutation, unique adhesion and unique penetration.

It should be noted that the magnetically polarized liquids of the above TDC and FIU tests do not constitute an essentially pure population of the new chemical species of magnecular clusters ~~magneccules~~, as it is the case of the scan of FIG. 7 for gases. This is due to the presence in macroscopic percentages of conventional molecules, which must be evidently absent to have an essentially pure population of magnecular clusters ~~magneccules~~. This occurrence was also expected and it is due to the insufficient value 12,000 G of the magnetic field used in the polarization of the liquids. In fact, additional tests, not reported here for brevity, conducted by exposing the same mixture of tap water and fragrance oils to extremely strong magnetic fields, on the order of 10^{16} Gauss at molecular distances, have proved the complete disappearance of any identifiable molecule and the sole composition of the mixture as being that of an essentially pure

population of magnecular clusters ~~magnecules~~, exactly as it is the case for gases exposed to magnetic fields of similar intensity. The essentially pure population of liquid magnecular clusters ~~magnecules~~ is generally obtained by exposing the liquids to electric discharges which can, this time, break down conventional liquid molecules into their dimers and individual atoms. As a result, for the case of an essentially pure population, liquid magnecular clusters ~~magnecules~~ are generally constituted by molecules, dimers and individual atoms, as it was the case for gases and in accordance with the definition of magnecular clusters ~~magnecules~~.

Gaseous, liquid or solid magnecular clusters ~~magnecules~~ have truly novel and important, industrial, commercial, and consumer applications in a variety of fields, including, but not limiting to, fuel industry, fragrance industry, paint industry, adhesive industry, medical industry, etc., among which we note:

- 1) Regarding the fuel industry, truly new fuels composed of an essentially pure population of magnecular clusters ~~magnecules~~ are now industrially feasible to produce on a mass scale. The new fuels possess dramatic increases of energy content; surpass all EPA requirements without a catalytic converter; emit during combustion no carcinogenic, carbon monoxide or other toxic substances; reduce the emission of carbon dioxide in gasoline combustion by about 50%; emit in the exhaust up to 14% breathable oxygen; are dramatically safer than gasoline; and are cost competitive with respect to the latter. In particular, the new fuels with magnecular structure are produced from the processing of liquid waste by the PlasmaArcFlow reactors of FIGS. 26 and 27, although the best possible liquid is crude oil. Rather than turning crude oil into the polluting and expensive gasoline, this invention permits the processing of crude oil into a new fuel with magnecular structure, which is dramatically cleaner, cheaper and safer than gasoline. In view of all these features, it is a truism to state that the new

chemical species of this invention can produce a revolution in electric power generation, the fuel and automotive industries to the benefit of the environment and the consumer. Moreover, the carbon-free version of a magnecular structured gas ~~magnegas~~, called magnecular hydrogen ~~maghydrogen~~ because it is constituted by hydrogen with a magnecular structure, is dramatically better than conventional hydrogen because its larger atomic density, the avoidance of liquefaction for use as a fuel for internal combustion engines, and provides a longer duration and larger energy output. Finally, the use in fuel cells ~~of~~ called magnecular hydrogen ~~maghydrogen~~ provides a quantum increase in efficiency, and, when burning with a magnetically polarized oxygen or magnecular oxygen ~~called magoxygen~~, it provides an ever greater increase in efficiency and duration, with evident benefits for the industry, the consumer and the environment.

2) Regarding the fragrance industry, magnecular clusters ~~magneccules~~ permit the industrial production and consumer use of basically new perfumes, which are water based, rather than currently available perfumes, which are alcohol, based. The former perfumes have dramatic advantages over the latter, such as: alcohol ages the human skin, while water does not; water based perfumes evaporate much slower than their alcohol based counterpart, thus lasting longer; perfumes with a magnecular structure penetrates the human skin much deeper than the alcohol based perfumes, thus providing a longer lasting and individualized fragrance. In particular, water based perfumes can be used for the first time by those whose religion prohibits the use of alcohol based perfumes.

3) Regarding the paint industry, magnecular clusters ~~magneccules~~ permit the industrial production and commercial or consumer usage of basically new paints, which adhere to

walls dramatically, more than conventional paints due to the unique adhesion of magnecular clusters ~~magnecules~~.

4) Regarding the adhesive industry, magnecular clusters ~~magnecules~~ permit the industrial production and use of basically a new adhesive with adhesion dramatically greater than that of currently available adhesives, again due to the unique adhesion of magnecular clusters ~~magnecules~~. In particular, different adhesives are currently needed for different substances, such as wood, ceramics, metals, etc. Due to the universality of their unique adhesion, magnecular clusters ~~magnecules~~ permit the elimination of these differences and the use of only one adhesive for all possible substances.

5) Regarding the medical industry, magnecular clusters ~~magnecules~~ permit numerous new applications. For instance, this invention permits new methods for delivering drugs consisting of their penetration through the skin, by therefore eliminating in appropriate cases the delivery of drugs via injection. This new method is permitted by the unique penetration of magnecular clusters ~~magnecules~~ through other substances due to a combination of factors, such as the reduction of the average size which is inherent in the magnetic polarization combined with magnetic induction, according to which magnecular clusters ~~magnecules~~ can literally propagate from one to the other molecule of a given substance. The advantage of this new method of drug delivery is evident, for instance, in the case of infected wounds where the use of conventional drugs remains in the surface of the human body, thus requiring injection of the drug and its propagation throughout the entire human body, at times with well known side effects, just to reach an infection localized in one small part of the body. By comparison, drugs with magnecular structure can easily penetrate throughout the entire infected area and below, precisely in view of the indicated magnetic induction and related unique penetration. Basically new drugs

are also permitted by the unique features of magnecular clusters ~~magneeules~~, such as their unique release of heat, which can be used for new lotions usable in massages, or other treatments. Yet another medical application is the capability to preserve indefinitely the sterilization of surgical instruments when immersed within magnetically polarized water, as compared to the current exposure of said surgical instruments to air, and the consequential loss of their sterile character prior to their use in surgeries. In fact, magnetically polarized water is easily completely sterilized and remains so on an indefinite basis, since it does not permit the reproduction of bacteria or other living organisms due to its structural difference from the water molecules needed for such reproduction.

It should however be stressed that each and every one of the above novel industrial, commercial or consumer applications crucially depends on the technological capability to reach an essentially pure population of magnecular clusters ~~magneeules~~ because none of the indicated new applications is meaningful when only traces of magnecular clusters ~~magneeules~~ occur in substances with conventional molecular structures.